

Clinical Efficacy of Minimally Invasive Interventions in the Treatment of Biliary Peritonitis as a Complication of Operations for Cholelithiasis

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ABSTRACT

Objective: This study analyzed 49 cases of bile peritonitis caused by bile leakage after bile duct surgeries, aiming to identify causative factors and assess the effectiveness of various treatments. Postoperative bile peritonitis incidence was found to be 0.8%, with "small" bile duct injuries accounting for 57.2% and main bile duct damage contributing to 42.8%. **Methods:** Diagnostic and therapeutic approaches included ultrasound-guided punctures, transduodenal endoscopic interventions, and laparoscopic techniques. Cases of main bile duct damage identified within 48 hours were treated with high-precision Roux-en-Y gastrointestinal anastomosis (GEA). **Results:** Minimally invasive methods effectively avoided relaparotomy in 93.3% of patients with "small" bile duct injuries. In contrast, early detection and surgical precision in managing main bile duct injuries provided optimal outcomes, emphasizing the criticality of timely intervention. **Novelty:** This study highlights the significant role of minimally invasive techniques and early detection in managing bile peritonitis, reducing the need for relaparotomy, and improving patient outcomes. The findings underscore the utility of combining advanced diagnostic and surgical strategies for bile duct injuries.

INTRODUCTION

Among the causes leading to the development of bile peritonitis, the main ones are bile leakage into the abdominal cavity after operations on the bile ducts from the accessory bile ducts, an incompetent stump of the cystic duct after cholecystectomy, dislocation of the drainage installed after choledochotomy, intraoperative damage to the common hepatic duct. According to the literature, the incidence of bile peritonitis varies significantly: from 0.4% to 4% [1]; [2]; [3].

The difficulty of early diagnostics of intra-abdominal bile leakage leads to delayed repeated surgical intervention and, as a consequence, to an unfavorable treatment outcome. On the other hand, the difficulty of diagnostics also explains the unjustified performance of relaparotomies in 0.6-17% of patients. Intensive therapy, the use of antibiotics and modern methods of pain relief carried out in the postoperative period significantly change the picture of the developing complication, obscuring acute phenomena, erasing the signs of a catastrophe in the abdominal cavity. Therefore, the classic picture of complications develops rarely and, as a rule, late, and the performance of relaparotomy is accompanied by high mortality. Therefore, at the slightest suspicion of trouble, it is necessary to conduct a number of studies that can be the beginning of active, targeted dynamic observation [4]; [5]; [6].

Since the treatment of bile peritonitis is undoubtedly a complex task and requires the efforts of specialists of various profiles, the outcome of surgical interventions largely depends on the choice and rational sequence of application of various methods [7]; [8]. In this regard, further prospects for improving the results of surgical treatment depend to a certain extent on the use of gentle surgical interventions, performing operations at earlier stages.

Objective of the study is optimization of diagnostics and treatment tactics with the predominant use of minimally invasive methods of surgical correction in bile peritonitis after operations on the bile ducts.

RESEARCH METHOD

The result of examination and treatment of 49 patients with bile peritonitis, which developed as a result of bile leakage into the abdominal cavity after operations on the bile ducts, are presented.

The source of postoperative bile leakage and peritonitis in 9 cases were additional (aberrant) bile ducts (Lushka ducts) in the gallbladder bed, in 14 cases – failure of the cystic duct stump due to slipping of clips or ligatures, in 5 patients – GI from a defect in the wall of the common hepatic duct. as a result of spontaneous loss, i. e. dislocation of the installed drainage from the hepaticocholedochus, in 21 - iatrogenic damage to the main bile ducts.

Taking into account modern trends in the development of surgery, in order to solve the research problems aimed at developing new treatment and diagnostic tactics for GB, the patients were divided into two groups. Group I (comparison group) included 22 patients (1.1% of 2048 patients) with postoperative bile peritonitis as a complication of operations on the bile ducts, operated in the period 2001-2010, in the complex treatment of which standard generally accepted approaches were used. The second group (main group) – 27 (0.7% of 3801 patients), operated on in the period 2011-2020, for whom the algorithm for conducting treatment and diagnostic measures was based on the principles of the FTS - accelerated recovery program (ARP) and minimally invasive surgical interventions were used as priority methods of surgical treatment.

In case of bile leakage into the abdominal cavity and local bile peritonitis with a volume of up to 100 ml according to ultrasound data in the comparison group (6 patients), recanalization was performed in 3 patients. counter-openings with drainage of the subhepatic region. Three patients underwent relaparotomy: the source of bile leakage in 1 case was dislocation of the drainage from the hepaticocholedochus, which was re-fixed. In another 2 cases, the source of bile leakage was insufficiency of the cystic duct stump, which was re-ligated. The subhepatic region was sanitized and drained.

In case of bile leakage into the abdominal cavity and local bile peritonitis with a volume of up to 500 ml occupying the subhepatic area and the right lateral canal according to ultrasound data in the comparison group (6 patients) due to the insolvency of the cystic duct stump, relaparotomy with repeated ligation of the cystic duct was

performed in 2 patients. In this case, in 2 patients the cause of the insolvency of the cystic duct stump was choledocholithiasis and biliary hypertension, they underwent relaparotomy with choledocholithotomy and drainage of the common bile duct. 2 patients with spontaneous prolapse of the drainage from the CC also underwent relaparotomy with repeated drainage of the common bile duct. The operations were completed with sanitation of the abdominal cavity and drainage of the subhepatic space, right lateral canal and pelvic cavity.

Damage to the main bile ducts was the cause of bile leakage and diffuse bile peritonitis in 10 patients of the comparison group. Reconstructive surgeries were performed in 5 cases, of which, in case of marginal damage to the common hepatic duct, 2 patients underwent suturing of the defect on a T-shaped drainage. In case of complete intersection of the common hepatic duct, biliobiliary Anastomosis was performed in 3 patients. Reconstructive surgeries were performed in 5 patients: hepaticoduodenal anastomosis was performed in 2 patients, external drainage of the proximal stump of the common hepatic duct was performed in 3 patients as the first stage due to peritonitis, then after 3 months hepaticojejunostomy was performed on a transhepatic frame drainage.

In the main study group (7 patients), with biloma due to bile leakage from aberrant ducts in the gallbladder bed with a volume of up to 100 ml according to ultrasound data, 3 patients required punctures under echographic control in order to evacuate the accumulation of fluid in the subhepatic space. Another 2 patients underwent relaparoscopic re-clipping of the Lyushka ducts. In one patient, the cause of bile leakage was failure of the cystic duct stump due to clip displacement; relaparoscopic re-clipping was performed. Also, in one case of external bile leakage through drainage and accumulation of bile in the subhepatic space due to loss of choledochostomy drainage, RPCG with EPST and nasobiliary drainage were the final method of stopping the bile leakage.

In case of bile leakage and local bile peritonitis with a volume of up to 500 ml according to ultrasound data in the comparison group (9 patients) with incompetence of the cystic duct stump (7 patients) due to choledocholithiasis and biliary hypertension, RPCG with EPST and nasobiliary drainage and relaparoscopic surgery with clipping of the incompetent stump were performed in 2 patients. Another 5 patients underwent abdominal cavity sanitation and repeated clipping of the cystic duct as the cause of postoperative bile peritonitis.

Relaparotomy, choledocholithotomy with drainage of the common bile duct and sanitation of the abdominal cavity were performed in 1 patient with diffuse bile peritonitis. In another patient, the cause of limited bile peritonitis was bile leakage from an aberrant bile duct of the bladder bed; the biloma was evacuated by repeated punctures.

In case of damage to the main bile ducts, bile leakage into the abdominal cavity and diffuse bile peritonitis were observed in 11 patients in the main group. Of these, 3 patients

underwent Roux-en-Y GEA with TPCD, and 1 case underwent high precision Roux-en-Y GEA without frame drainage. In our observations, 2 patients with complete intersection of the HC detected on the first day after surgery also underwent high precision Roux-en-Y GEA without a frame. In 1 patient with bile peritonitis, the first stage was abdominal cavity sanitation and drainage of the hepatic duct. Reconstructive surgery was performed 3 months later - GEA with TPCD. Restorative surgeries were performed in 3 patients. BBA was applied to 1 patient with intersection of the HC. In 3 patients with marginal damage of no more than $\frac{1}{2}$ the diameter of the duct, the duct was sutured in 2 cases; in one observation, a stent was installed in the GC after ERCP.

RESULTS AND DISCUSSION

Comparative analysis of the treatment results of patients with postoperative bile peritonitis as a complication after cholecystectomy showed that in case of bile leakage with the development of local bile peritonitis with a fluid volume of up to 100 ml under the liver in the comparison group, all 6 patients underwent repeated surgical interventions - 3 patients underwent recanalization counter-openings with drainage of the subhepatic region, 3 patients underwent relaparotomy. Directly opposite results were obtained in the main group, where special endoscopic and diapeutic methods made it possible to avoid repeated surgery - relaparotomy in all 7 patients - 3 patients underwent biloma puncture under ultrasound control, in another 3 patients, correction of bile leakage into the abdominal cavity and sanitation of the subhepatic region were performed during relaparotomy, in one observation, dislocation of drainage from the common bile duct and bile leakage corrected with EPST and nasobiliary drainage.

Correction of bile leakage with development of bile peritonitis with volume up to 500 ml in the comparison group (6 patients) in 100% of cases was performed by repeated surgical intervention - relaparotomy: - in 2 patients, abdominal cavity sanitation was supplemented by ligation of the incompetent stump of the cystic duct; - in 2 patients, abdominal cavity sanitation was supplemented by choledocholithotomy and 2 more repeated drainage of the hepaticocholedoch. Improvement of the treatment and diagnostic tactics of patient management in the main group (9 patients) using endoscopic transduodenal interventions - EPST and nasobiliary drainage made it possible to stop bile leakage into the abdominal cavity in 2 patients. Relaparoscopic surgery made it possible to eliminate the cause of bile leakage in 6 cases - repeated clipping of the cystic duct and aberrant bile duct in the gallbladder bed was performed, and only 1 patient required relaparotomy with abdominal cavity sanitation, choledocholithotomy due to residual choledocholithiasis.

Thus, the introduction of minimally invasive methods of correcting bile leakage into the abdominal cavity such as transduodenal endoscopic interventions, ultrasound-guided abdominal punctures, and laparoscopy allowed 93.3% of patients with "minor" bile duct injuries to avoid repeat laparotomy. Relaparotomy was performed only in 1 patient.

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In case of damage to the main bile ducts leading to the development of diffuse biliary peritonitis caused by damage to the main bile ducts, the efficiency of high Roux-en-Y GEA using precision technology was proven in detecting biliary peritonitis in the next 48 hours. All 3 patients showed good results in the immediate and late postoperative periods. Performing GEA on TPDC (performed in 2 patients of the main group and 2 in the comparison group) is certainly justified when applying a biliodigestive anastomosis in conditions of infiltrative changes in the duct wall in biliary peritonitis detected later than 48 hours after CE. Replaceable transhepatic drainage, on which GEA is formed, is extremely necessary in the above situations. At the same time, in 2 patients of the main group and 6 in the comparison group in biliary peritonitis due to damage to the GC, the proximal stump of the common hepatic duct was drained in the first stage. Reconstructive surgeries were performed on them after 3 months. BBA (imposed on 5 patients in the comparison group and 1 in the main group) and GDA (in 3 patients in the comparison group) in all cases resulted in strictures of the ductus arteriosus and BDA. They underwent repeated reconstructive surgeries. Suturing of the ductus arteriosus defect covering less than $\frac{1}{2}$ of the duct diameter is indicated only using precision techniques.

Purulent and septic complications after repeated interventions for bile leakage and postoperative bile peritonitis after hepatic endoscopy were observed in 8 patients (36.4%) in the comparison group: - ongoing bile peritonitis (2 patients); - formation of subhepatic and subdiaphragmatic abscess (2 patients); - suppuration of the postoperative wound (4 patients). Of these, 1 patient (4.5%) died. The cause of death was acute renal and hepatic failure against the background of abdominal sepsis.

Complications were observed in 3 patients (11.1%) after surgical correction of bile leakage and peritonitis after CE. In 2 observations, there were purulent-septic complications, in 1 case, acute pancreatitis after endoscopic papillophincterotomy. Mortality was not observed in the main group.

CONCLUSION

Fundamental Finding : The incidence rate was 0.8%, with 57.2% caused by "minor" bile duct injuries and 42.8% by intraoperative damage to the main bile duct. **Implication :** Ultrasound-guided punctures, transduodenal endoscopic procedures, and laparoscopy minimized the need for relaparotomy in 93.3% of cases with minor injuries, while early detection and Roux-en-Y GEA yielded optimal outcomes for major bile duct injuries. **Limitation :** The study's focus on specific minimally invasive techniques may limit generalizability across diverse surgical settings or patient populations. **Future Research**

: Further studies should explore broader applicability of these methods and assess long-term outcomes in varied clinical environments to enhance surgical strategies for bile peritonitis management.

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